Chapter II
Geographical Perspective of The Study Area

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2.1 Introduction

In order to make a spatial study of any area, it is necessary to understand the salient geographical features of that region. The regional setting is important in establishing the patterns of inter-regional and intra-regional space relations (Sharma, 1981). In view of this, in this chapter an attempt has been done briefly on geographical features, i.e., location and extent, administrative setup, historical background, physiography, geology, river and drainage system, soil, climatic conditions, economic minerals, flora and fauna of the study unit.

2.2 Location and Extent of the Study Unit

The study area is one of the seventeen districts in Dhaka division and falls within a geographic unit of the Brahmaputra-Jamuna Floodplain. The latitudinal extension lies between 24° 01' North to 24° 47' North, and longitudinally it stretches from 89° 44' East to 90° 18' East. It is cornered on the north by Jamalpur district, on the south by Manikganj and Dhaka district, on the east by Mymensingh and Gazipur districts, and the mighty river Jamuna on the west (vid., Fig. 2.1) and fixes the western boundary of the study unit. The total geographical area of the study unit is 3,413.38 sq.km. The district is elongated north and south and tapering towards the north with its base on the south. The north-south length varies from 85 to 90 km approximately and east-west breadth ranges from 45 to 50 km. The southernmost base is not more than 35 km long east to west. Although the name of the district is derived from the present name of its headquarters, the origin of the name Tangail itself is lost in antiquity. There are different views about the origin name of the district. The popular view is that the district name has been derived from the word Tanga meaning horsecart, which was largely parked at the present district headquarters for carrying Indigo. The district of Tangail was renamed as Tangail Zila in 1984.
Fig. 2.1: Location Map of the Study Area

Location: 90°45'E to 90°16'E longitude & 23°06'N to 24°47'N latitude

Geographic Area: 3414 Sq. Kms.

Relief: Low lying area with 30' average variation

Major Rivers: Jamuna, Dhaleswari and Bangal

No. of Thana: 11

No. of Mauza: 2,029

No. of Urban centre: 11

Population: 30,02,428 (1991)

Density of Pop: 879 / Sq. Km.

Occupation: Agriculture, Fisheries, and Small Scale Industries
2.3 Formation and Administrative Setup

Tangail, previously one of the subdivisions of Mymensingh district with its headquarters at Atia, emerged as a full-fledged district (notification no. GAI-242/68-1598, dated Dhaka, the first October, 1969) on the first day of December, 1969. It was at that time when some portion of Assam was included in the former province of Bengal and it was brought under different systems of administration. Since then the name Atia was dropped and the name Tangail was adopted as the official name of the subdivision. At present the district consists of eleven thanas. The number and names of unions (the lowest type of Local Government unit in the rural area, which consists of mauzas1 villages, and an average size of a union is 19.3 sq. km with population of about 20,000) and the number of villages in each thana are shown in the Appendix II.1. The district now comprises of 101 unions, 1978 mauzas and 2489 villages (BBS, 1996). There are only two Municipalities (legal urban area unit under Local Government Division, also called a Pourashava or self-governing town) in the whole of Tangail district, viz., the Tangail Municipality, and the Gopalpur Municipality (formed in 1975 with the inclusion of Suti union). These two municipalities consist of eight ward2s.

The present Tangail district came into being on December 1, 1969. Formerly it was a sub-division of Mymensingh district comprising Atiya, Kagmari, and Barabazar parganas. The history of Tangail district can be discussed as several time periods, viz., Pre-Mughal period (1575 and beyond), Mughal period (1975-1756), British period (1756-1947), Pakistan period (1947-1971), and Bangladesh period (1971-todate). But that much is not relevant. However, the last two periods are worth mentioning.

1 Mauza is the lowest revenue unit with a given jurisdiction list number.
2 Smallest local administrative (local govt' unit) unit of urban area.
Pakistan period (1947-1971): As a consequence of continuous struggle for the preservation of rights under the banner of the Muslim League the separate state of Pakistan came into being on 14 August, 1947 with the East Pakistan (now Bangladesh) as one of its provinces. Tangail district was included in the then East Pakistan as one of the subdivisions of the Mymensingh district, and after emerged as a full-fledged district and thus remained within Pakistan till the emergence of Bangladesh in 1971.

Bangladesh period (1971-to-date): Till early 1984, there used to be only 21 major administrative units known as districts. Tangail was the small district in respect of area and stood 20th in rank. The districts were divided into sub-divisions (Mahakuma). By February 1984, sub-divisions were upgraded to district level, so that by mid-1984 the number of districts were increased to 64. Since Tangail district had no any subdivision, it remains so.

2.4 Physiography and Geology

Tangail district is peculiar in physiographic set up, diversified in undulating tracts, and rise and fall, wavy tracts, not monotonous alluvial plains alone (vid., Fig.-2.2). There are unending series of small plains. It is a zone of rivers, ditches and forests, with irregular depressions here and there, while tillas and hillocks are many jutting out features of the landscape. Floodplains occupy about 66 per cent of the district and uplifted fault blocks (sometimes referred to as terraces) about 34 per cent.
Fig. 2.2: Relief Map of Tangall District: A Three Dimensional View
Spate (1954) outlined five physiographic sub-regions in the Bengal Basin. Of these three only (II, III and V) fall in Bangladesh and Tangail district is in one of the sub-region. Spate’s outline regions were elaborated upon by Johnson (1955) who divided Bangladesh into five regions, with twelve sub-regions of which Jamuna Floodplain and Madhupur Tract sub-divisions fall in Tangail. On the basis of physical features and drainage pattern, Rashid (1991) divided twenty-four sub-regions, with fifty four units in Bangladesh of which Brahmaputra-Jamuna Floodplain sub-region with Jamuna-KaliGanga Floodplain unit, and Madhupur Tract sub-region fall in Tangail. A comprehensive classification (16 geomorphic units) of Bangladesh physiography has been made by Mafizuddin (1992) in the light of Brahmer’s (1969) suggested divisions whose basis was soil survey. Of which the Jamuna Floodplain, the Old Brahmaputra Floodplain, and Madhupur Tract fall in Tangail. A total of 34 physiographic units and sub-units are recognised in Bangladesh (FAO, 1988), of which two main units; viz., River Floodplain, and uplifted block fall in Tangail. However, Tangail can be divided into two main physiographic sub-divisions, on the basis of physical features and the nature of geological origin. These two subdivisions again can be divided into following six units in the light of Brinkman (1967) reported units whose basis was soil survey (vid., Fig.-2.3).

I. River Flood Plain
   (a) Active Jamuna Floodplain;
   (b) Young Jamuna Floodplain;
   (c) Old Jamuna Floodplain; and
   (d) Old Brahmaputra Floodplain;

II. Uplifted Block
    (a) Shallowly Weathered Madhupur Tract; and
    (b) Deeply Weathered Madhupur Tract.

¹where Ganges-Brahmaputra river system forms.
Fig. 2.3: Physiographic Divisions of Tangail District

Legend
- Active Jamuna floodplain
- Deeply weathered Madhupur tract
- Old Brahmaputra floodplain
- Old Jamuna meander floodplain
- Young Jamuna meander floodplain
2.4.1 River Floodplain

The floodplain has been developed due to diversion of the Brahmaputra to the present channel of the Jamuna. The Brahmaputra used to flow on the present Old Brahmaputra channel prior to 1787. This is the left bank floodplain of the Jamuna River where slopes away from the river, thus the tendency for over bank spillage to occur on to the floodplain. The chief characteristic of the Jamuna Floodplain is numerous char formation, and olive grey sediments. The active and meander parts may also be seen in short reaches. The channel migration is typical of the Jamuna River. Ridges are wide and detailed topography is complex. Alluvium are non-calcareous. The floodplain is made up predominantly of sands and silts, with mainly loams on the ridges but with clays in the basins. On most of the soils a plough pan impedes internal drainage. The Jamuna is a major river and during the monsoon extends to more than five kilometers width. Several distributaries of the Jamuna flow through here, of which the Dhaleswari is the main distributery and is the main channel of a complex river system. Most of this area is flooded more than 0.91 m deep during the monsoons. Flooding occur from three sources, direct rainfall, direct over bank spillage from the internal regional rivers or tributaries. The regular river flooding has resulted in locally thick layers of silt deposits which impact on agriculture at the local level. Groundwater recharge is generally better. Both chemically and physically, the soils of the Jamuna floodplain appear to be among the best of the country.

2.4.1.1 Active Jamuna Floodplain

Stratified alluvium and young, shallow soils over stratified alluvium are predominate here. The relief is characteristically irregular, consisting of numerous narrow ridges with inter-ridge depressions and narrow channel remnants. Near
present or former Jamuna channels, there are generally large areas of sandy sediments. Elsewhere, the deposits are generally silty clay loams to silt loams. In part of these, where no erosion or new deposition has taken place for few decades, a shallow homogenized soil with weak to moderate prismatic structure has developed. Soils are generally neutral to moderately alkaline. On a part of this land, the seasonal floodwater moves rapidly, destroying or damaging any paddy or jute present. There is a continuing hazard of river erosion, due to the constantly shifting channels.

2.4.1.2 Young Jamuna Floodplain

The relief is gentler, ridges are broader and there are more and larger basins. Most soils are still relatively shallow over stratified alluvium. Most of the basins are seasonally flooded to moderate depth; most of the ridges are shallowly or moderately deeply flooded.

2.4.1.3 Old Jamuna Floodplain

Like Young Jamuna Meander Floodplain here also gentle relief, broader ridges and larger basins are common. Most soils are developed to depths of 1 to 1.5 m., except in a few places where a sandy substratum at a shallow depth has prevented deeper soil formation. Almost all of the soils are poorly drained and seasonally flooded. Grey silty clay loams and some brownish silt loams are the main floodplain ridge soils, with grey silty clays and clays in the basins.

2.4.1.4 Old Brahmaputra Floodplain

Soils are developed in Old Brahmaputra alluvium. Most of the land is flooded from moderate to high depth. Small high patches are intermittently flooded by
rainwater. Small basins are deeply flooded. The small areas of floodplain ridges are flooded to generally moderate depth. Almost all the soils are poorly drained and seasonally flooded. *Grey and brownish, locally dark grey, silty clay loams* are the main floodplain ridge soils, and *dark grey clay soils* predominates in the basins.

### 2.4.2 Uplifted Block

The uplifted block, which is known as *Madhupur Tract* is formed in unconsolidated clay, possibly of Pleistocene age. This elevated tract is probably the result of the very interesting tectonic movements to which the Bengal Basin is being subjected (Rashid, 1991, p.79). The area belongs to older alluvium of the ancient rivers and has been uplifted in recent times (Morgan and McIntire, 1959). It comprises an area of highly dissected, faulted and weathered soil cover on the surface. A considerable variation in elevation is observed, ranging from about 0.5m on the south to about 3m from the adjacent floodplain. Higher elevations are found in the western part. A dendriatic stream pattern was developed in the Tract; a pattern emphasised by the dense jungle cover on the ridges, and artificially flattened paddy fields in the entrenched stream valleys. These flattened stream valleys are locally known as *baid* possibly derived from the Arabic word *Wadia* meaning valley. La Touch (1919) and Rizvi (1957) considered the formation of the area by interglacial deposition carried by the *Ganges and the Brahmaputra*. Morgan and McIntire (1959) recognised the tract to be a *Pleistocene terrace*, taking similarly question with Gulf coast and considered the ancient floodplain of the *Ganges-Brahmaputra*. Miah (1972) contended that the tract has developed in a deltaic environment and considered it to be an *uplifted delta*. Innumerable entrenched meandering rivers flow over the region. Most of the rivers seem to be antecedent in terms of their drainage system.
Madhupur Tract having marked characteristics of high relief, undulating, rolling and gently level topography is typical in its landform pattern. The Madhupur Tract has topography where preponderance of rillwash, sheetwash, and gullies are widely found. But the denuded region are sometimes encountered with decelerated erosion due to human interference, sometimes these denuded landmasses resemble tiny badland (Mafizuddin, 1981).

2.4.2.1 Shallowly Weathered Madhupur Tract

Shallowly Weathered Madhupur clay type soil parent material is dominant in this area, which is strongly acid to moderately alkaline, locally calcareous, dense and firm or very firm, strongly structured with slickensides and in grey or olive-grey with some yellowish mottles. Most of this land is under poor forest or scrub. Nearly level, intermittently flooded areas are occupied by a grey, reliable and porous moderately fine textured soil underlain by dense clay at shallow depth (Brinkman, 1967, p.9).

2.4.2.2 Deeply Weathered Madhupur Tract

Deeply weathered Madhupur clay type soil parent material is dominant one. The deeply weathered parent clay is strongly to very strongly acid, friable and strongly and coarsely mottled red, yellow and grey. Most of the land is cultivated; part of the better-drained soil is under forest.

Tangail district almost occupies the central part of the Ganges-Brahmaputra-Meghna delta. In the sub-surface, this area falls in the hinge zone lying between the Indian platform to the north-west and the Bengal foredeep to the south-east, i.e.; it lies in the transition zone. Bangladesh, along with the Indian state of West Bengal, consists primarily of a larger alluvial basin floored with quaternary sediments deposited by the Padma and the Brahmaputra Rivers and their numerous associated
streams and distributaries (Morgan and McIntire, 1959). Among the four distinct
geologic formation (a. Tertiary and older highlands, b. Pleistocene Terrace; far
below the sub-surface, c. Early recent Tippeta surface, and d. Recent flood plain),
some parts of Madhupur Pleistocene Terrace and some parts of recent flood plain fall in
the Tangail (vid., Fig-2.4). This Recent floodplain formation has been recognised as
the flood plains of earlier Padma-Brahmaputra river system. However, as the
Madhupur Tract occurs above the level of the present flood plains it indicates that
there has been a differential movement between Pleistocene and the recent times.
Where faults occur, as along the western flank of the Madhupur Tract, the difference
in relief between the Pleistocene and the recent floodplain is considerable. But
along the eastern and southern sides of the Madhupur Tract, the Pleistocene slopes
gradually between the over-lapping recent sediments. While most of the recent
floodplains go under water during the rainy season, when the rivers are in spate, the
entire Madhupur Tract stands above the floods, drained by relatively few small
streams, which naturally have developed distinctive, entrenched and meandering
courses. The older alluvium still peeps to the surface in the large tract of hard, red
soil stretching from Dhaka city to Jamalpur including the western part of Tangail
district and western part of Mymensingh district. This large Tract of land is widely
known the Madhupur jungle. The minerals are not found.
Split of the Indian portion of the Gondwana mass and began moving towards Asia (Jurassic period, 194 to 136 million years ago)

A portion of the northeastern part of India fractured and sank below sea-level

Like other parts of the basin large section of the early deposits remain as the Madhupur Tract of the central region of which some parts fall in Tangail District.
2.5 Drainage System

The study of the drainage system reveals that the area has a dense network of river or streams and some of them have a different type of behaviours in changing their course/channels because of plain/flat area. The general terrain slopes in the area are from north-east to south-west, which has a significant role in drainage of the area. Drainage of the study area takes place at four levels; viz., the boundary river system (primary), the regional river system (secondary), the Khol system (tertiary), and the beel system (quaternary). The mechanism by which the study area drains relates directly to this hierarchical system and its interconnections. Excess rainfall accumulates first in the beels, until these have reached their capacity. Gradually the extent of inundation increases until the small khals, which link the beels, begin to flow. These khals form an interlinking network within the internal drainage system and they are also the means by which the transfer of water between the regional rivers and the flood plain takes place.

2.5.1 Major Rivers

Tangail is a riverine district. The western border of Tangail is formed by the R. Jamuna (the lower course of the Brahmaputra), which joins the Ganges at Aricha about 23 km. The streams of the R. Brahmaputra and R. Tista in 1787 experienced abnormal flood and the additional volume of water created the violent R. Jamuna. The R. Jamuna was once a much smaller water course, but owing to the change in the course of the Brahmaputra river, the majority of the flow of this major river now passes down the Old Jamuna alignment. The name of the original watercourse braided bed with large sands shoals and islands (chhars). It is a very unstable morphologically, with severe bank erosion, resulting in recorded shifts in bank alignment of over one km in a single year (GOB, 1991). The mean annual flood discharge of the Jamuna at Bahadurabad is estimated to be 65,000 cumecs, with the 1 in 100 year flood discharge estimated at 1,04,000 cumecs (NCRS phase I Report, Hydrology, Annex), by which measure too, it ranks with the Amazon, Congo, La Plata, Yangste, Mississippi, and Meghna as one of the seven largest rivers.

The Dhaleswari, first an old channel of the Ganges and then of the Brahmaputra, cuts across the south-western corner of the district on its powerful sweep to join the Meghna near Narayanganj. The old name of Dhaleswari was Gajhata. It used to flow
afterwards by the Salimabad channel and then at last by Porabari channel (Ahmed, 1968). The *Dbaleswari* is a left bank distributary of the R. *Jamuna*. The *Dbaleswari* offtakes from the *Jamuna* are in three separate locations, the northern offtake, is near Bhuapur. Just south, the *Pungi river* offtakes, and flows approximately parallel the river *Jamuna* to join the southern limb about 20 km downstream of its off take from the R. *Jamuna*. The southernmost off take, called the *Old Dbaleswari*, joins the *Kaliganga*, which then joins with the northern branch to become the main *Dbaleswari*. This then joins the river *Buriganga* flowing into the confluence of *Padma* and *Meghna* Rivers. The *Dbaleswari* is a typical meandering river, its monsoonal sediment load determining its processes of erosion and deposition. The mean annual flood of the *Dbaleswari* at Sagir is estimated to be 688 cummecs.

**2.5.2 Interior Rivers**

A part of the eastern boundary of study district runs close to the *Banar river*. The *Lohajang river* takes off from the *Jamuna river* passes north of Tangail town and then to the southeast, to join the *Banghi river* in the southeast of the area. The latter enters the area from the north, flows by Madhupur town and southward through a valley and along the western edge of the *Madhupur Tract*. The *Bangshy* forms a natural barrier to the Madhupur jungle on the Tangail side all the way from Madhupur to Mirzapur. It is only fordable at two or three places near Basail on its way to river *Meghna*. Other rivers are *Khirus*, *Nangla Nadi*, and *Atai*. Now these subsystems of rivers, viz., *Bangshi* and the *Lohajang*, *Khirus*, *Nangla Nadi*, *Atia*, and *Jhinai* are all dying out because of the shift of the *Old Brahmaputra River* from its former channel to the present *Jamuna* channel. The interior rivers can be categorised as falling into two systems (vid., Fig.-2.5): the *Dbaleswari-Kaliganga* in the south western part; and the *Pungi-Bangshi* in the central part.

The *Dbaleswari-Kaliganga* system is made up with distributaries, off taking in the southern half of the R. *Jamuna*’s left bank. The *Pungi-Bangshi* system is a mixed system, supplied by local rainfall (*Madhupur Tracts*) and over spilling, along the northern half of the R. *Jamuna*’s left bank. In practice, these two systems are largely connected by secondary branches and spill channels during flood flows. Under medium and low water-stages, no flow is able to get into most of the distributaries.
3.3: RADARSAT and GMS – 5 Data Series Showing the Areas Affected by Flood – 1998 (Data Sets for 7, 31 July and August, 1998)
Soil is one of the important factor for the study of its varieties, properties and characteristics to the researcher to know the spatial variation in its distribution and its contribution to the agriculture, vegetation etc. The soils in about two-thirds of the district are developed in recent and sub-recent river alluvium. The soils in the eastern part of the area are developed in older unconsolidated sediment; i.e., the Madhupur clay\(^4\). The soils have developed to different degrees and in different ways due to differences in drainage, and age and kind of sediments.\(^5\) However, soil of the recent floodplain is typically dark, loosely compacted and have high water content and appreciable quantities of organic matter. Tangail district essentially, as a matter of fact, owes its soil to the alluvial action of the existing rivers chiefly the Brahmaputra and the Jamuna, which by constantly changing and shifting their channels have deposited enormous silts over the entire area. **Madhupur Tract soil**, on the other hand is well oxidised, and typically reddish brown or tan and are mottled. Ferruginous calcareous nodules are common. Lower water content in the soil has resulted in firmer, more compacted material. Organic content is very low and confined only to the surface soil profile. Twenty-five soil series and two miscellaneous land types have been recognised, ten series in the **Jamuna and Old Brahmaputra Floodplains**, and fifteen in the **Madhupur Jungle Tract** (Brinkman, 1967, p.20). However, there are twenty two types of different soils have been observed having different characters (**Appendix II.2**). Four types of soil are classified in the district by **Soil Survey of Bangladesh** which is shown in **Table-2.1**.

\(^4\) Name in accordance with the geological **Map of Pakistan** (1964).

**Table-2.1: Soil Classification**

<table>
<thead>
<tr>
<th>Soil type</th>
<th>Characteristics</th>
<th>Places of occurrence <em>(thana or parts thereof)</em></th>
<th>Suitable crops</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-calcareous floodplain soil</td>
<td>Dark grey, finely mottled brown and brown soils with dark grey flood coatings with seasonally acid top soils and near neutral sub soils. Mainly seasonally deeply flooded soils of the old Bharamaputra-Karatoya-Bangali (part) and old Meghna estuarine floodplains</td>
<td>Basail, Ghatail, Kalihati, Mirzapur.</td>
<td>Broadcast <em>aman</em>, water transplanted <em>aman</em> and <em>boro</em>.</td>
</tr>
<tr>
<td>Shallow red-brown terrace soils and deep red-brown terrace soils</td>
<td>Well to moderately well drained, red and brown, strongly acid clay loams and clays, part over compact Modhupur clay as 1-3 feet, part over deeply mottled clay substratum.</td>
<td>Ghatail, Madhupur, Sakhipur, Mirzapur.</td>
<td>Gazari forest, grass-land, shrub etc. Mainly jackfruits and <em>aus</em> and <em>rabi</em> crops. <em>Aus</em> and transplanted <em>aman</em>, deep water <em>aman</em> or <em>boro</em>.</td>
</tr>
</tbody>
</table>

*Source: BBS, 1987*
The climate of Bangladesh is characterised by high temperatures, heavy rainfall often excessive humidity and fairly marked seasonal variations. Though more than half of this area is north of the tropics, the effect of the Himalayan mountain chain is such as to make the climate tropical. In recent years the weather pattern has been erratic, with a reduction of the cool, dry season. This could be a temporary phenomenon, or it may be the beginning of the long-term changes due to global warming caused by Greenhouse gases (Rashid, 1991, p.74). The area enjoys the monsoon type of climate of the Indian subcontinent. This climate is characterised by the seasonal reversal of the wind to a comparatively dry and mild winter, and hot and wet summer. There are four distinctively identifiable seasons in a year despite the traditional six seasons of the Bengali calendar. These seasons are:

(a) the winter season (December to February);
(b) the unsettled period of pre-monsoon (March to May);
(c) the monsoon/rainy season (June to September); and
(d) the post/retreating monsoon (October to November)

The climate can be best understood by an analysis of its components.

Table 2.2: Climatic Elements

<table>
<thead>
<tr>
<th>Elements</th>
<th>Months</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Jan</td>
</tr>
<tr>
<td>T (mx) in °C³</td>
<td>24.2</td>
</tr>
<tr>
<td>T (mm) in °C⁵</td>
<td>10.4</td>
</tr>
<tr>
<td>H in %³</td>
<td>80</td>
</tr>
<tr>
<td>Wind speed Kts</td>
<td>0.97</td>
</tr>
<tr>
<td>R in mm³</td>
<td>0</td>
</tr>
<tr>
<td>Sunshine h</td>
<td>4.4</td>
</tr>
</tbody>
</table>

Note: ¹monthly maximum temperature in °C; ²monthly minimum temperature in °C; ³relative humidity in %; ⁴monthly wind speed in KTS (Knots); ⁵monthly rainfall in mm.; and ⁶duration of sunshine hours.

2.7.1 Temperature

The temperature continues to be uniform from early March to early October, the range being only 2° C or so only. The average maximum temperature ranges from 30.4° to 33.7° C. The maximum temperature in the year is reached between the last week of March and the end of May. The average minimum temperature of the district as a whole is 10° C in January and the average annual temperature is 25° C. In June there is fall in temperatures, because of the monsoon rains. Throughout November and December the temperatures fall gradually. In February and March, the temperature rises quite sharply.

In short the climate is moderate, and April and May are the hottest months (recording a maximum temperature of 38° C). The cold weather from November to February is pleasant with temperature falling to 10° C.

2.7.2 Rainfall

Rainfall in the district is not evenly distributed throughout the year. The average rainfall is 169 mm. The northeast monsoon characterises generally dry to cool period from November to February, with rainfall amounts only 2.3% of the annual total. The south-west monsoon winds usually begin in June and last to October, which is characterised by the heavy, persistent rains of the year. At least 80% of the rainfall occurs during June to October (rainy season). The rest of the rainfall occurs during March to May due to Nor'westers (North-westerlies) Kalo-Baisakhi disturbance (vid., Fig.-2.6). The sub-seasonal period from March to May in characterised by convective rainfall, which yields some 20-25% of the annual total.
The three main sources of rainfall in area are:

(i) the western depressions of winter;
(ii) the early summer thunderstorms known as the Nor'westers; and
(iii) the summer rains from the S.W. Trades known as the Monsoons.

Fig. 2.6: Temperature, Relative Humidity and Rainfall of Tangail District

2.7.3 Humidity

The humidity in and around the study is high throughout the year. Only on certain days when the hot Paschi blows strongly, does the relative humidity drop quite low. The least humid months are February, March and April. The saturation deficit is lowest in July or August (see, Fig. 2.7), but the most drying month is September, when the humidity is high and the rainy days are not many. The average relative humidity for the whole year ranges from 88 to 72%.
Fig. 2.7: Climograph and Hythergraph of Tangail District

Climograph

Hythergraph
2.7.4 Other Climatic Conditions

Fog and mist is a common feature of the weather from November to March. At the beginning and end of this period, mist usually develops as the sunsets and remains till sunrise. In December and January, there is fog on many nights, and may persist even up to noon. Heavy long lasting fogs usually form in these two months, over the Jamuna River. Dewfall's also very heavy in these two months. Dew possible accounts for two centimeters or more of precipitation in the wetter areas.

Because the economy and food supply are so closely linked to climate, significant variations in climate events have profound effects on society (Ericksen, 1993). The study unit is not exception to this. In these circumstances, climate can be thought of as a hazard, rather than a resource. Floods, and cyclones are examples of climatic hazards in the district, which are the common experiences and occurrences.

The impact of cyclone originating in the Bay of Bengal is also occasionally felt very much during the months of October to November. The magnitude of damage and destruction sometimes becomes irreparable.

2.8 Vegetation

Due to rapid growth of population the pressure on forest resources has increased very substantially. The net result of all these is that the forest sector is in a state of crisis. The situation is particularly acute even in the Madhupur Tract where forest coverage is more.
The total area under forest in the district is 435.01 sq.km., which works out to about 13 per cent to the total geographical area of the district and about 3 per cent of total forest area of the country. The main forested area of the district is in Madhupur Tract, and are known as the Bhawal, Atia, Kagmari and Madhupur Garh forests (collectively called Garh Gajhari). Each of them has numerous outlines, and are themselves cut into by fields and settlements. Most of the Atia and Kagmari forest no longer exists, having been converted to agricultural use by squatters. In the better-forested tracts, such as Madhupur Garh, the main tree is Sal, followed by Ajuli (Terminalia belerica), Jiyal (Lannea grandis), Didha (Laagerstroemia), Kaika (Adina cordifolia), Gandhi Gajari (Miliusa velutina) and Chaplash. Undergrowth is scarce in stands of pure Sal (Gajari) but is plentiful in other places. It consists of Fulkuri, Sotti (Pennsetum setosum), Sarpagandha, Kalomegh, Basak, Katakhai (Bridetta retusa). Cane (Calamus tenuis), Bon-Am (Mangifera oppositifolia), Chirata, Shonalu, and obnoxious weeds such as Spatholobus, roxbhurgil, Entada ascandens, Mucuna pruriens and Cuscuta reflexa (Shornolata). Bengal coffee (Coffeea bengalensis) is also found. In the poorer forested areas there are large tracts with Korii as the main species and an undergrowth of Kurchi, Akanda, Mankata (Randia dumetorum), Thatch grass (Arundinacea cylindrica) and Mimosa pudica. There is an almost complete absence of Bamboos in these forests of the Madhupur Tract (Rashid, 1970). The important forest product is timber.
References


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